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FINAL REPORT

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APPLIED RESEARCH/DEMONSTRATION OF HOG MANURE AS A FERTILIZER SOURCE IN EAST-CENTRAL SASKATCHEWAN

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Applied Research/Demonstration of Hog Manure as a Fertilizer Source in East-Central Saskatchewan
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Summary

The project was designed to evaluate the usefulness of hog manure in an annual cropping system and to investigate potential nitrogen losses through leaching. The study used three different rates of hog manure applied in spring of 2000, compared to granular fertilizer, and unfertilized check, and a summerfallow treatment. Barley was seeded in the year of application and canola was seeded the following year unfertilized. Yield with the hog manure was slightly lower in the year of application with the 6000, and 9000 GPA treatments due to excessive lodging problems, although the crop performance in the second year was much better on those two treatments over granular and unfertilized plots. Movement of nitrates through the soil profile was very similar in both manure and granular nitrogen treatments, with the largest levels of available nitrate staying in the top foot of soil. This study has shown the use of hog manure in an annual cropping system to be a viable option in the east central region.

Background

The loss of the WGTA has led to increased opportunities for intensive livestock production in Saskatchewan to flourish. This sector would include intensive hog production. With a sparse population density, and a large land base for potential hog manure application this province is a logical place for production to increase. The east-central region in particular, with its high freight costs and relative abundance of feed grains, is very well suited to hog production. Issues have arisen surrounding how these operations will affect both surrounding crop growth and possibly groundwater sources. This project was established to provide a local and unbiased information source regarding these issues.

Project Objectives

1. To provide producers with locally based, unbiased information on the value of hog manure as a fertilizer source.
2. To address concerns that hog manure has a negative impact on crop growth.
3. To investigate potential nitrogen losses through leaching.
4. To improve the public's perception of the hog industry.

Study Description

The project was set up using a randomized complete block design (RCBD) consisting of the following treatments: Spring 2000 manure application at rates of 3000, 6000, and 9000 gallons/acre, granular nitrogen rates of 50, 100, 150 lbs actual N/acre, unfertilized check, and a summer fallow treatment. . The manure used in 2000 was analyzed at enviro-test laboratories and was shown to provide a rough equivalent of 30lbs N/1000 gallons. The trial consisted of four replicates. The granular nitrogen treatments used urea side banded and also included 25lbs P_2O_5/acre seed placed and 15 lbs K_2O/acre side banded. The summer fallow treatment was to be tilled in the 2000 cropping year and cropped in the 2001 year. Plots were sown to two-row malt barley (c.v. Metcalf) in 2000, with yields being obtained from the different treatments. Fall soil tests were also taken up to four feet from each treatment in 2000 to determine if nitrogen was moving downwards through the soil or if it was remaining in the crop rooting zone. All plots were sown to argentine canola (c.v. LL 2633) in 2001 and received no fertilizer, with yields being recorded and fall soil tests conducted on all treatments to assess available nitrate levels in the soil up to a four foot depth.

Results and Discussion

A. Yield Impacts

	Mean Yield (kg/ha)	
Treatment	**2000- Barley**	**2001- Canola**
Summerfallow	N/A	800 ab
Check- no fertilizer	3880 a	640 a
3000 GPA	5700 d	1110 c
6000 GPA	5080 b	1580 d
9000 GPA	4850 b	1600 d
50 N, 25 P, 15 K	5000 bc	990 bc
100 N, 25 P, 15 K	5680 d	1040 bc
150 N, 25 P, 15 K	5620 cd	1070 c
LSD	**660**	**250**

Means followed by different letters are significantly different ($p<0.05$)

In both years the unfertilized check treatment showed a significantly lower yield than all other treatments, which was to be expected. In the first year of the study yields were significantly higher with the 3000 GPA treatment over the higher levels of manure. During the 2000 growing season there was crop lodging experienced in the higher manure treatments due to heavy rains and winds, which would explain some decreased yield numbers. The granular nitrogen treatments in 2000 would suggest that the 100 lbs/ac rate would maximize returns using granular fertilizer, as the 150 lbs/ac showed a slightly decreased yield. In the year of application it would appear that the 6000, and 9000 GPA rates provided more than sufficient levels of fertility, which led to the lodging

problems. The 3000 GPA rate was equivalent to the 100 lbs/ac rate of granular nitrogen.

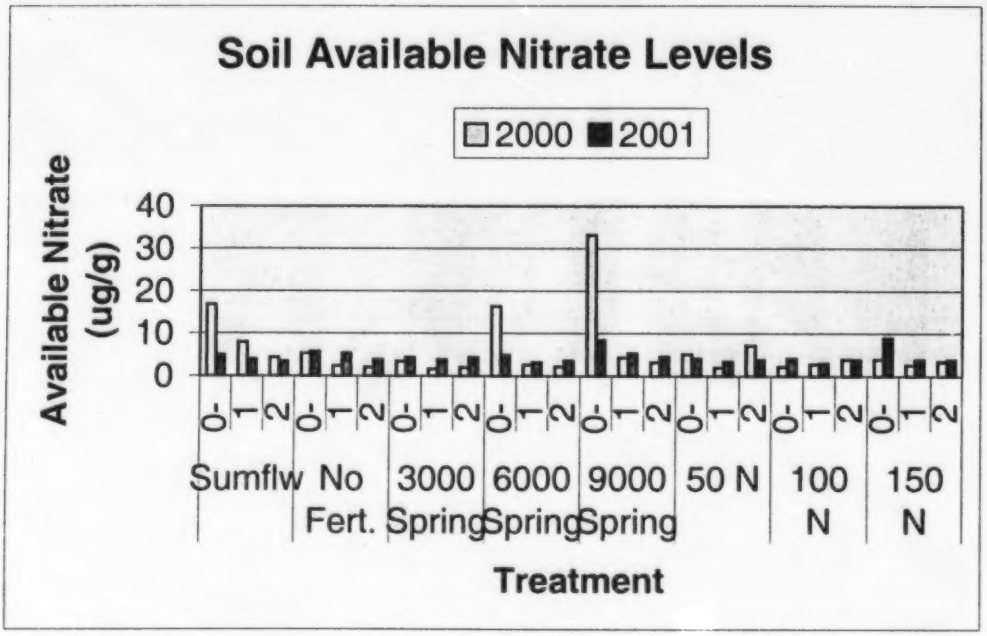
The 2001 crop was seeded with no fertilizer added to any of the treatments to assess the residual fertility from the previous years treatments. During the growing season it was visually possible to determine the differences in growth between fertility treatments. The unfertilized check showed a very poor stand and yield correspondingly was lowest on that treatment. The summerfallow plot did not show a statistically significant increase over the unfertilized check, or the 50 and 100 lb/ac granular nitrogen treatments ($p<0.05$). The 3000 GPA treatment did not differ significantly from any of the granular nitrogen treatments although it was still significantly higher than the summerfallow and unfertilized check. The 6000 and 9000 GPA treatments showed significantly better plant stands and plant quality through the year and both had significantly higher yields than all other treatments. Yield in 2001 may have been affected by a hail event on August 7th, however with the yields showing expected trends the differences seen are likely due to treatment effects.

There was little difference between the 6000, and 9000 GPA treatments, which would suggest that the optimal level of application would be 6000 GPA. The yield advantages in the second year of the study would make up for the slightly depressed yields experienced with those treatments in the year of application. The economic benefits of using hog manure are evident as with an application cost of $15.00 per acre, regardless of amount injected, and being able to produce two good crops off of this one application at the higher rates. The manure provided sufficient levels of nutrition to the crops in all aspects as no deficiency symptoms appeared.

B. Soil Nitrate Levels

Soil tests on each treatment were taken in fall of 2000 and 2001 to a depth of four feet and were analyzed for available nitrates. The cores were separated into three depths, 0-12, 12-24, 24-48 inches, and analyzed for available nitrate levels. A general trend, of highest nitrate levels in the top foot of soil and lower levels as you move down the column, developed. In the year of application the 6000 and 9000 GPA treatments did show high levels of available nitrate in the top foot but levels below that did not show much higher levels than seen with the granular nitrogen. The lack of elevated available nitrate levels at depth on the treatments make the likelihood of groundwater contamination unlikely due to the application of hog manure to the field. Growing season precipitation was greater in 2000 than in 2001: 277.1 and 160.2 mm respectively. This study was conducted on a clay loam soil and leaching was not a problem, however on a very sandy soil with higher rainfall leaching could possibly become an issue. The hail event in 2001 may have had a slight impact on the soil nitrate numbers but again due to the consistency of the data it is still believed these are treatment effects seen. By

the second year of the study the nitrate levels in fall were very similar in both the hog manure and granular nitrogen treatments.



Conclusions

Based on the two years of data from this study, hog manure proves to be an excellent source of fertility for crop growth with similar leaching properties of granular nitrogen products. The slight depression in yield experienced in the year of application, due to excessive fertility and lodging issues, on the higher rates of hog manure was offset by the improved performance of the crop in the second year of the study. The one application of the 6000 and 9000 GPA treatments proved to be sufficient for two cropping years, making it a very economically viable option for producers. Groundwater nitrate contamination from these application amounts is unlikely as the available nitrates stayed in the top foot of the soil and did not leach appreciably through the profile. This study has shown the use of hog manure as a source of fertility in an annual cropping system to be an economically and environmentally sound practice in the east central region. Research on this practice is ongoing to confirm the findings from this project.